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Cordana sinensis sp. nov. from southern China

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Abstract—A new species, *Cordana sinensis*, is described and illustrated from a specimen collected on dead branches of an unidentified broadleaf tree in Jiangxi Province, China. It is characterized by its integrated, polyblastic conidiogenous cells that produce ovoid to obclavate, medially 1–2-septate pale brown, smooth conidia with a slightly prominent hilum. A dichotomous key and a synoptic table to *Cordana* species, are provided.

Key words—asexual *Ascomycota*, *Cordanaceae,* hyphomycetes, saprobes, taxonomy

Introduction

Cordana Preuss was established with *C. pauciseptata* Preuss as the type species (Preuss 1851) and characterized mainly by macronematous, mononematous, unbranched, cylindrical, nodose or subnodose conidiophores and polyblastic, integrated, terminal or intercalary, sympodial conidiogenous cells, usually denticulate with tiny or conspicuous cylindrical denticles. The conidia are solitary, acropleurogenous, variably shaped (ovoid, obovoid, ellipsoidal, pyriform, or obpyriform), 0–1-euseptate and seceding schizolytically (Preuss 1851, Hughes 1955, Ellis 1971, Markovskaja 2003,

Seifert & al. 2011). Hernández-Restrepo & al. (2014), who expanded the generic concept to include integrate and discrete polyblastic conidiogenous cells that are intercalary nodose and swollen or umbellate at the conidiophore apices, provided a key for 19 accepted species. Thereafter, *C. johnstonii* M.B. Ellis, *C. musae* (Zimm.) Höhn., and *C. versicolor* D.J. Soares & R.W. Barreto were transferred to *Neocordana* Hern.-Rest. & Crous based on a phylogenetic analysis (Hernández-Restrepo & al. 2015). After the addition of four *Cordana* species by Ai & al. (2019) and Luo & al. (2019), *Cordana* currently contains 20 recognized species, of which only ten have been reported from China: *C. abramovii* Seman & Davydkina, *C. aquatica* Z.L. Luo & al., *C. ellipsoidea* de Hoog, *C. lignicola* Z.L. Luo & al., *C. lithuanica* Markovsk., *C. lushanensis* C.C. Ai & al., *C. meilingensis* C.C. Ai & al., *C. pauciseptata*, *C. uniseptata* L. Cai & al., and *C. terrestris* (Timonin) Hern.-Restr. & al. (Lu & al. 2000, Cai & al. 2004, Zhang 2018, Ai & al. 2019, Luo & al. 2019).

In the past, *Cordana* was associated with *Trichosphaeriaceae* (Müller & Samuels 1982) and *Chaetosphaeriaceae* (Réblová & al. 1999) based on ascomatal morphology.

Saprobic hyphomycetes are highly diverse on dead branches, and much taxonomic information has been published in China (e.g., Wu & Zhuang 2005; Ma & al. 2014, 2015, 2016; Ma & Zhang 2015; Xia & al. 2015, 2016; Ma 2016a,b; Xu & al. 2017, 2019; Zhang 2018; Qiu & al. 2020). In our study of these fungi from Jinggangshan Mountain, Jiangxi Province, an interesting hyphomycete with the morphological features typical of *Cordana* was collected on dead branches. It shows significant differences from previously described *Cordana* species and therefore is proposed as new.

Materials & methods

Dead branches were collected from humid environments and watersides in the forest ecosystems of southern China and placed in Ziploc™ plastic bags for transport to the laboratory, where they were processed, and examined as described by Ma & al. (2011). Microphotographs were prepared using a Nikon Eclipse E200 and SmartV550Dc digital camera, with a 100 × (oil immersion) objective at the same background and scale. Conidia were measured at their widest point. The minimum and maximum values for microscopic measurements are provided, with outliers in parentheses. Adobe Photoshop 7.0 was used to assemble photographs into plates. The specimens are deposited in the Herbarium of Jiangxi Agricultural University, Plant Pathology, Nanchang, Jiangxi, China (HJAUP).

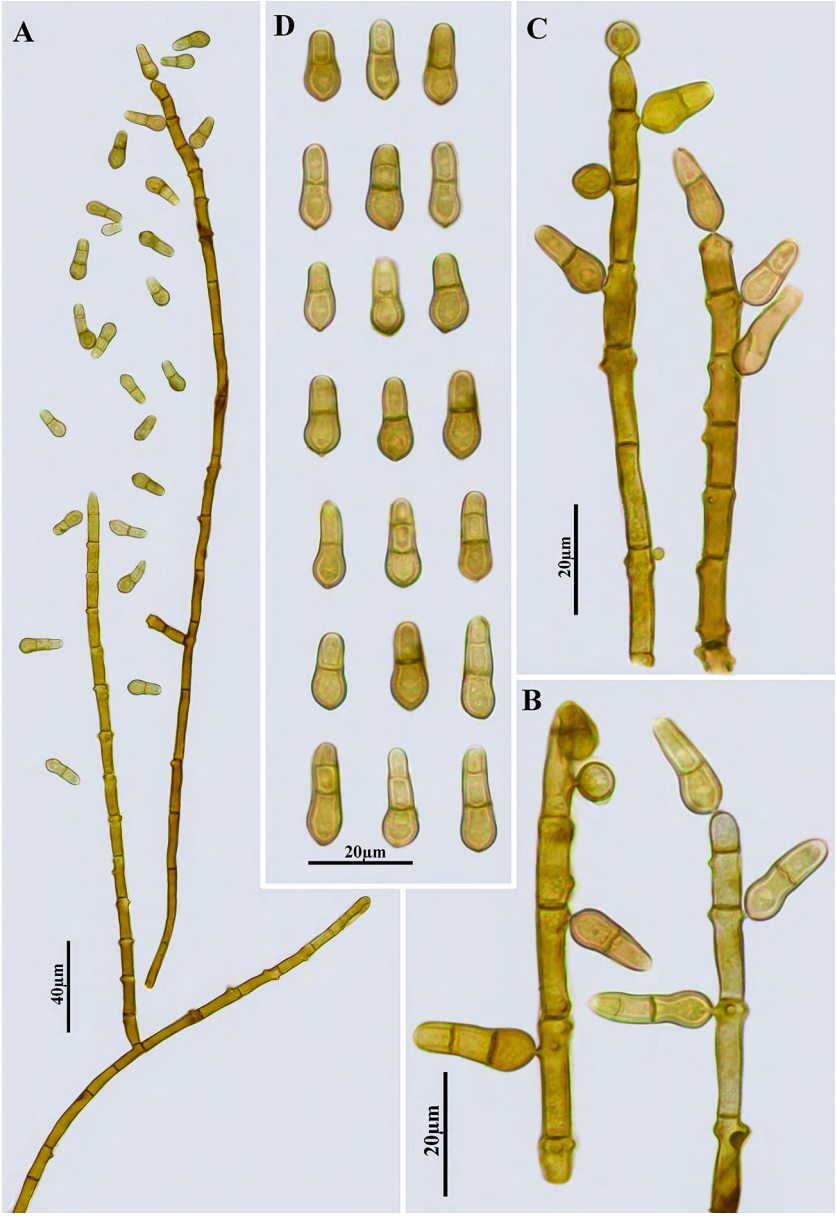

Fig. 1. *Cordana sinensis* (holotype, HJAUP M0172).
A–C. Conidiophores and conidia; D. Conidia.

Taxonomy

Cordana sinensis L. Qiu, K. Zhang, R.F. Castañeda & Jian Ma, **sp. nov.** Fig. 1

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Differs from *Cordana crassa* and *C. lithuanica* by its ovoid to obclavate, medially 1-septate or with 2-septate, narrower conidia.

Type: China, Jiangxi Province: Jinggangshan Mountain, Jingzhushan scenic spot, 26°32′28″N 114°06′57″E, on dead branches of an unidentified broadleaf tree, 6 Nov. 2014, J. Ma (**holotype**, HJAUP M0172).

Etymology: refers to China, where the fungus was collected.

Colonies on the natural substratum effuse, brown to dark brown. Mycelium partly superficial, partly immersed, composed of branched, septate, smooth, subhyaline to pale brown hyphae. Conidiophores macronematous, mononematous, simple or branched, erect, straight to flexuous, smooth, septate, brown to pale brown, cylindrical, sub-nodose, ≤400 µm long, 4–6.5 µm wide, with terminal and intercalary nodes, 5–7.5 µm wide. Conidiogenous cells integrated, polyblastic, terminal and intercalary, cylindrical-subnodose, with tiny prominent denticles at the nodes, percurrent elongated, 9.5–32 × 4–6.5 µm. Conidial secession schizolytic. Conidia solitary, acropleurogenous, ovoid to obclavate, 1–2-septate, pale brown, smooth, thick-walled, 13–20(–26.5) × 5–7.5 µm, dry, apical cell rounded, basal cell with a tiny prominent hilum.

Comments –Among the known species of *Cordana*, *C. sinensis* most closely resembles *C. crassa* Tóth and *C. lithuanica* Markovsk. in conidial shape. However, *C. crassa* and *C. lithuanica* produce asymmetrically 1-septate conidia while those of *C. sinensis* are medially 1–2-septate. In addition, *C. crassa* produces larger (20–24 µm long), ovoid conidia (Tóth 1975), and *C. lithuanica* produces shorter and wider (13–17.5 × 8–10 µm) obpyriform conidia (Markovskaja 2003).

With the addition of *C. sinensis*, *Cordana* is represented by 21 species (Table 1). All these species have integrated, polyblastic, terminal or intercalary, sympodial conidiogenous cells, except *C. bisbyi* (Timonin) Hern.-Restr. & al. and *C. terrestris* (Timonin) Hern.-Restr. & al., which bear discrete, polyblastic conidiogenous cells umbellately arranged at the apex of the conidiophores (Hernández-Restrepo & al. 2014). *Cordana* conidia are mostly smooth-walled and concolorous, but *C. indica* Subramon. & V.G. Rao and *C. verruculosa* Hern.-Restr. & al. produce echinulate or verruculose conidia. *Cordana inaequalis* S. Hughes, *C. mercadoana* Hern.-Restr. & al.,

Table 1 Comparisons of conidia and substrates of *Cordana* species. The new species is in bold.

Species	Conidia				Habitat	Type locality
	Size (μm)	Shape	Septation	Color		
C. abramovii[1]	18–31 × 12.5–15.5	Ovoid	1	Uniform	Fruitbodies of *aphyllophoralean basidiocarp* and wood	Georgia
C. andinopatagonica[2]	17–19 × 10–13	Obovoid to ellipsoid	1	Uniform	Leaf litter of *Nothofagus dombeyi*	Argentina
C. aquatica[3]	8–10 × 3–5	Mostly oblong, sometimes ellipsoid	1	Uniform	Submerged decaying wood	China
C. bisbyi[4, 5,*]	5–7.2 × 2.5–3.6	Cylindrical–oval	0	Uniform	Soil	Honduras
C. crassa[6]	20–24 × 13–15	Ovoid	1	Uniform	Rotting wood of *Fagus sylvatica*	Hungary
C. ellipsoidea[7]	8.7–11.5 × 4.3–4.7	Ellipsoid to oblong	1	Uniform	Soil	Nepal
C. inaequalis[8]	10–12.5 × 4–5	Ellipsoidal to ovoid	1	Variable	Rotten wood	Canada
C. indica[9,**]	11–20 × 4.5–7	Oval to oblong	1	Uniform	Dead leaves of *Casearia*	India
C. lignicola[3]	9–11 × 3.5–4.5	Mostly oblong, sometimes ellipsoid,	0–2	Uniform	Submerged decaying wood	China
C. lithuanica[10]	13–17.5 × 8–10	Obpyriform	1	Uniform	Decaying wood of *Fraxinus excelsior*	Lithuania
C. lushanensis[11]	5.5–8 × 2.5–4	Ellipsoidal to obovoid	0	Uniform	Dead branches	China

Species	Conidia				Habitat	Type locality
	Size (μm)	Shape	Septation	Color		
C. meilingensis[11]	10–13 × 5.5–7	Oblong or cylindrical	1	Uniform	Dead branches	China
C. mercadoana[4]	6–10 × 3–4	Oblong, obovoid or cylindrical	0–1	Variable	Dead twig	Spain
C. parasitica[12]	6–10 × 3–5	Oblong	1	Variable	Living leaves of *Aster trinervi* var. *odusti*	Japan
C. pauciseptata[13]	8–12 × 5–7	Broad ellipsoid to ovoid	1	Uniform	Rotten wood of frondose tree	Germany
C. semaniae[14]	21–27 × 9–15	Obovoid	0	Uniform	Bark of rotten *Quercus*	Russia
C. sinensis	**13–20 × 5–7.5**	**Ovoid to obclavate**	**1–2**	**Uniform**	**Dead branches**	**China**
C. solitaria[15]	6.5–9.5 × 4.5–6.5	Obovoidal	0	Uniform	Rotten wood	India
C. terrestris[4,16,*]	6–11 × 3–4	Oblong to ovate	1	Uniform	Soil	Canada
C. uniseptata[17]	13.5–23 × 8.5–11.5	Mostly broad ellipsoid	1	Variable	*Phyllostachys bambusoides* submerged in forest stream	China
C. verruculosa[4,**]	3–5.5 × 2–3.5	Ellipsoidal to obovoid	0	Uniform	Dead wood	Spain

[*]All conidiogenous cells are integrated polyblastic, except for *C. bisbyi* and *C. terrestris*, which are discrete polyblastic.

[**]All conidia are smooth, except for *C. indica*, which is echinulate and *C. verruculosa*, which is verruculose.

Data from: [1]Seman & Davydkina 1983; [2]Gamundí & al. 1979; [3]Luo & al. 2019; [4]Hernández-Restrepo & al. 2014; [5]Timonin 1961; [6]Tóth 1975; [7]de Hoog 1973; [8]Hughes 1983; [9] Subramoniam & Rao 1976; [10]Markovskaja 2003; [11]Ai & al. 2019; [12]Togashi & Onuma 1934; [13]Preuss 1851; [14]Davydkina & Mel'nik 1989; [15]Rao & de Hoog 1986; [16]Timonin 1940; [17]Cai & al. 2004.

C. parasitica Togashi & Onuma, and *C. uniseptata* L. Cai & al. produce versicolored conidia. Only five species produce nonseptate conidia: *C. bisbyi*, *C. lushanensis* C.C. Ai & al., *C. semaniae* Davydkina & al., *C. solitaria* V. Rao & de Hoog, and *C. verruculosa*, while most form 1-septate conidia, although in *C. lignicola* Z.L. Luo & al. and *C. sinensis*, 2-septate conidia are occasionally present. All 21 species except *C. parasitica* are usually found on rotten wood or dead branches, or in soil.

Key to *Cordana* accepted species

1. Conidiogenous cells discrete, polyblastic, umbellately arranged over the swollen apex of the conidiophores 2
1. Conidiogenous cells integrated, polyblastic, intercalary or terminal on the conidiophores 3
2. Conidia 0-septate, cylindrical-oval, 5–7.2 × 2.5–3.6 µm ..... *C. bisbyi*
2. Conidia 1-septate, oblong to ovate, 6–11 × 3–4 µm ..... *C. terrestris*
3. Conidia nonseptate 4
3. Conidia septate 7
4. Conidia verruculose, 3–5.5 × 2–3.5 µm ..... *C. verruculosa*
4. Conidia smooth, ≥5.5 µm long 5
5. Conidia obovoid, guttulate, 21–27 × 9–15 µm ..... *C. semaniae*
5. Conidia ≤9.5 × 6.5 µm 6
6. Conidia ellipsoidal to obovoid, 5.5–8 × 2.5–4 µm ..... *C. lushanensis*
6. Conidia obovoidal, 6.5–9.5 × 4.5–6.5 µm ..... *C. solitaria*
7. Conidia oval to oblong, echinulate, 11–20 × 4.5–7 µm ..... *C. indica*
7. Conidia smooth, variably sized 8
8. Conidia versicolorous 9
8. Conidia concolorous 12
9. Conidia ellipsoidal or ovoid 10
9. Conidia oblong, obovoid, or cylindrical 11
10. Conidia mostly broadly ellipsoidal, 13.5–23 × 8.5–11.5 µm ..... *C. uniseptata*
10. Conidia narrowly ellipsoidal to ovoid, 10–12.5 × 4–5 µm ..... *C. inaequalis*
11. Conidia oblong, only 1-septate, 6–10 × 3–5 µm ..... *C. parasitica*
11. Conidia oblong, obovoid or cylindrical, 0–1-septate, 6–10 × 3–4 µm ..... *C. mercadoana*
12. Conidia 0–2 or 1–2-septate 13
12. Conidia only 1-septate 14
13. Conidia mostly oblong, sometimes ellipsoid, 0–2-septate, 9–11 × 3.5–4.5 µm ..... *C. lignicola*
13. Conidia ovoid to obclavate, 1–2-septate, 13–20 × 5–7.5 µm ..... *C. sinensis*

14. Conidia of both cells more or less equally wide 15
14. Conidia of both cells unequally wide 18
15. Conidia ovoid, with a pigmented septal pore, 18–31 × 12.5–15.5 µm . . . . . *C. abramovii*
15. Conidia oblong, cylindrical, ellipsoid to oblong or ellipsoid to ovoid, lacking pigmented septal pore, ≤13 × 7 µm 16
16. Conidia ellipsoid to oblong, 8.7–11.5 × 4.3–4.7 µm . . . . . *C. ellipsoidea*
16. Conidia ≥5 µm wide 17
17. Conidia oblong or cylindrical, 10–13 × 5.5–7 µm . . . . . *C. meilingensis*
17. Conidia broadly ellipsoid to ovoid, 8–12 × 5–7 µm . . . . . *C. pauciseptata*
18. Conidia ovoid, 20–24 × 13–15 µm . . . . . *C. crassa*
18. Conidia obpyriform, obovoid, ellipsoid or oblong, ≤19 × 13 µm 19
19. Conidia mostly oblong, sometimes ellipsoid, 8–10 × 3–5 µm . . . . . *C. aquatica*
19. Conidia ≥13 × 8 µm 20
20. Conidia obovoid to ellipsoid, 17–19 × 10–13 µm . . . . . *C. andinopatagonica*
20. Conidia obpyriform, 13–17.5 × 8–10 µm . . . . . *C. lithuanica*

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